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14. ABSTRACT

This is the final report for Year 3 of AFOSR Contract FA9550-07-C-0053 that began in March 2010 and ends in February 2011. We have worked on fundamental theory of turbulence and charged-particle energization in magnetized plasmas. As a result of our research activities, 15 papers have been published in refereed scientific journal, two manuscripts that had been submitted for publication earlier are now accepted or in press, and two other manuscripts have been submitted for publication and are under review.

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KINETIC THEORY OF TURBULENCE IN MAGNETIZED PLASMA, CHARGED PARTICLE ACCELERATION, AND CROSS-SCALE COUPLING

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01/10/2014
Final Report

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Project Participants

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Activities and Findings

This is the final report for Year 3 of AFOSR Contract FA9550-07-C-0053 that began in March 2010 and ends in February 2011. We have worked on fundamental theory of turbulence and charged-particle energization in magnetized plasmas. As a result of our research activities, 15 papers have been published in refereed scientific journal, two manuscripts that had been submitted for publication earlier are now accepted or in press, and two other manuscripts have been submitted for publication and are under review. All the publications and submitted or accepted manuscripts acknowledge the AFOSR Contract FA9550-07-C-0053. The Principle Investigator Dr. Ta-Ming Fang has participated in scientific discussions in many of the publications, although his name does not always appear in the manuscripts. However, in one major paper [Yoon and Fang, Nonlinear theory of ion-cyclotron instability, *Plasma Phys. Contr. Fusion*, under review (2010)] he played an important role. The following is the list of publications:

Journal Publications

— *Published* —

[1] T. Rhee, C.-M. Ryu, M. Woo, H. H. Kaang, S. Yi, and P. H. Yoon, Multiple Harmonic Plasma Emission, *Astrophys. J.* **694**, 618, doi: 10.1088/0004-637X/694/1/618 (2009).

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[4] J. Pavan, L. F. Ziebell, P. H. Yoon, and R. Gaelzer, Decay of beam-driven Langmuir wave into ion-acoustic turbulence in two dimensions, *Plasma Physics and Controlled Fusion* **51**, 095011, doi: 10.1088/0741-3335/51/9/095011 (2009).

[5] C. S. Wu, P. H. Yoon, and C. B. Wang, On non-resonant proton heating via intrinsic Alfvenic turbulence, *Physics of Plasmas* **16**, 054503, doi: 10.1063/1.3147924 (2009).

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[15] L. F. Ziebell, P. H. Yoon, J. Pavan, and R. Gaelzer, Nonlinear evolution of beam-plasma instability in inhomogeneous medium, *Astrophys. J.* **727**, 16 (2011).

— Accepted for Publication or in Press —

[1] K. Rha, C.-M. Ryu, and P. H. Yoon, Particle heating by parametric decay of Alfvén waves, *Plasma Phys. Control. Fusion*, in press (2010).

[2] L. F. Ziebell, P. H. Yoon, J. Pavan, and R. Gaelzer, Ion acoustic enhancements generated by beam-plasma instability in auroral cavity, *J. Geophys. Res.*, in press (2010).

— *Under Review* —

[1] P. H. Yoon and T.-M. Fang, Nonlinear theory of ion-cyclotron instability, *Plasma Phys. Contr. Fusion*, under review (2011).

[2] L. F. Ziebell, P. H. Yoon, J. Pavan, and R. Gaelzer, Two-dimensional quasilinear beam-plasma instability in inhomogeneous media, *Plasma Phys. Contr. Fusion*, under review (2011).